# The Process of Land Cover and Land Use Change in Central Africa

## Historical over view and ongoing activities

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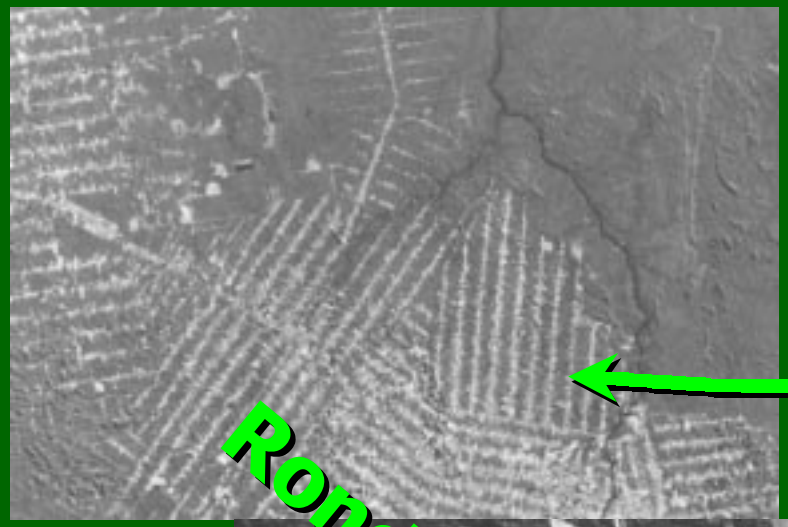
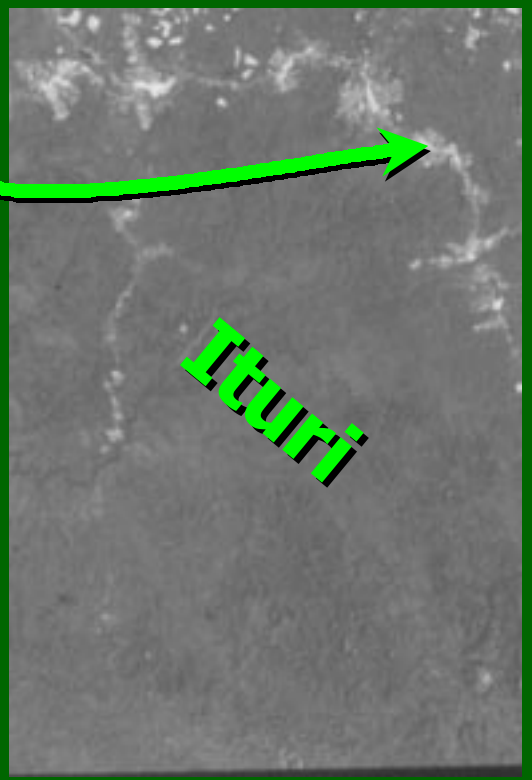
# Congo Basin is different?



Roadside clearing

Rondonia



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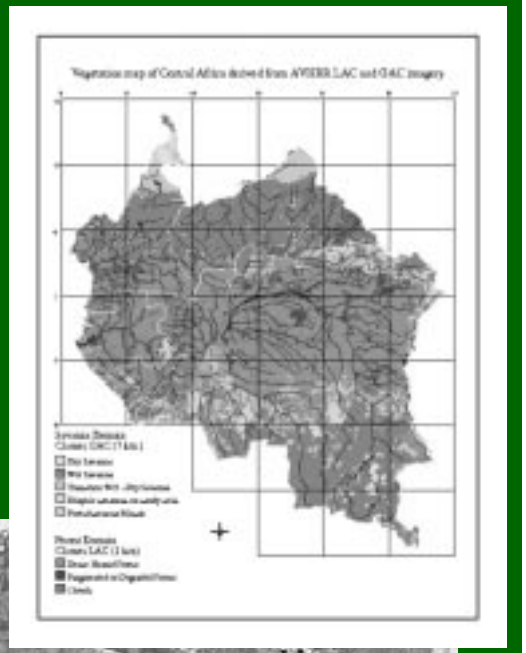
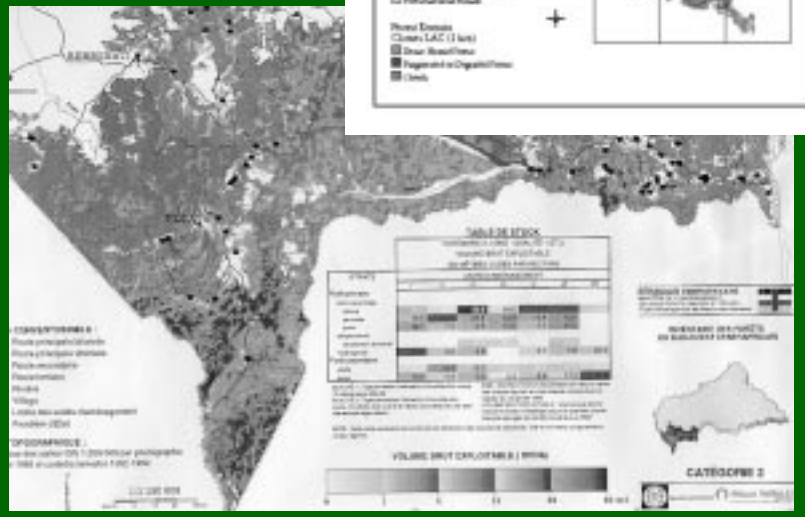
# Ongoing LCLUC research

## CARPE - USAID

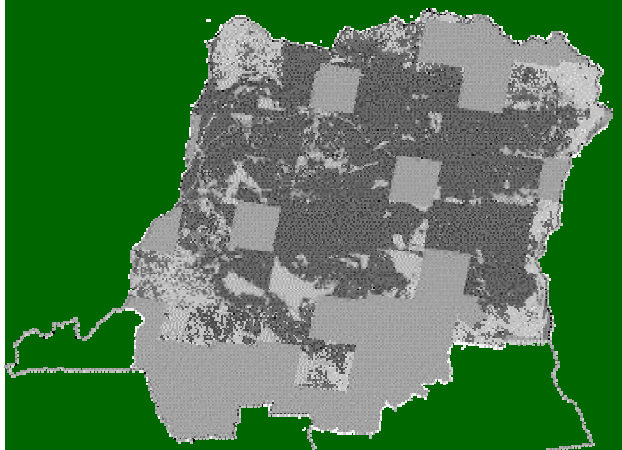
- low resolution forest cover and forest disturbance (NASA, TREES, UMd)
- logging concessions and protected areas (WRI, WWF, WCMC)
- determinants of deforestation in 7 forest management units in CAR (PARN)
- forest resource use intensity (WRI and Uwe Deichmann UN)
- future land cover scenarios (WRI, Boston College)
- agricultural land transformation in Cameroon derived from road density and travel times (UMd)



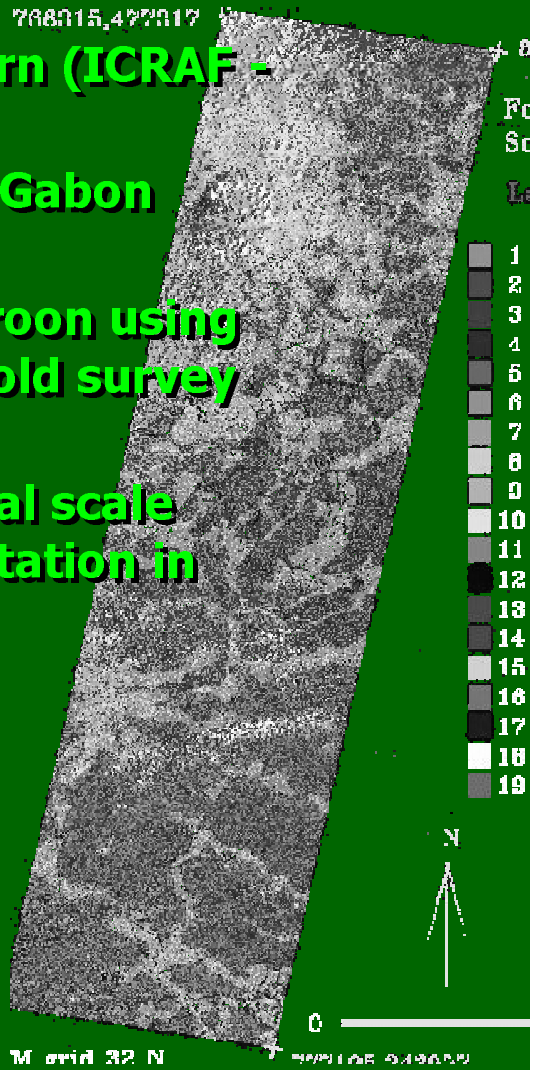


# Ongoing LCLUC research

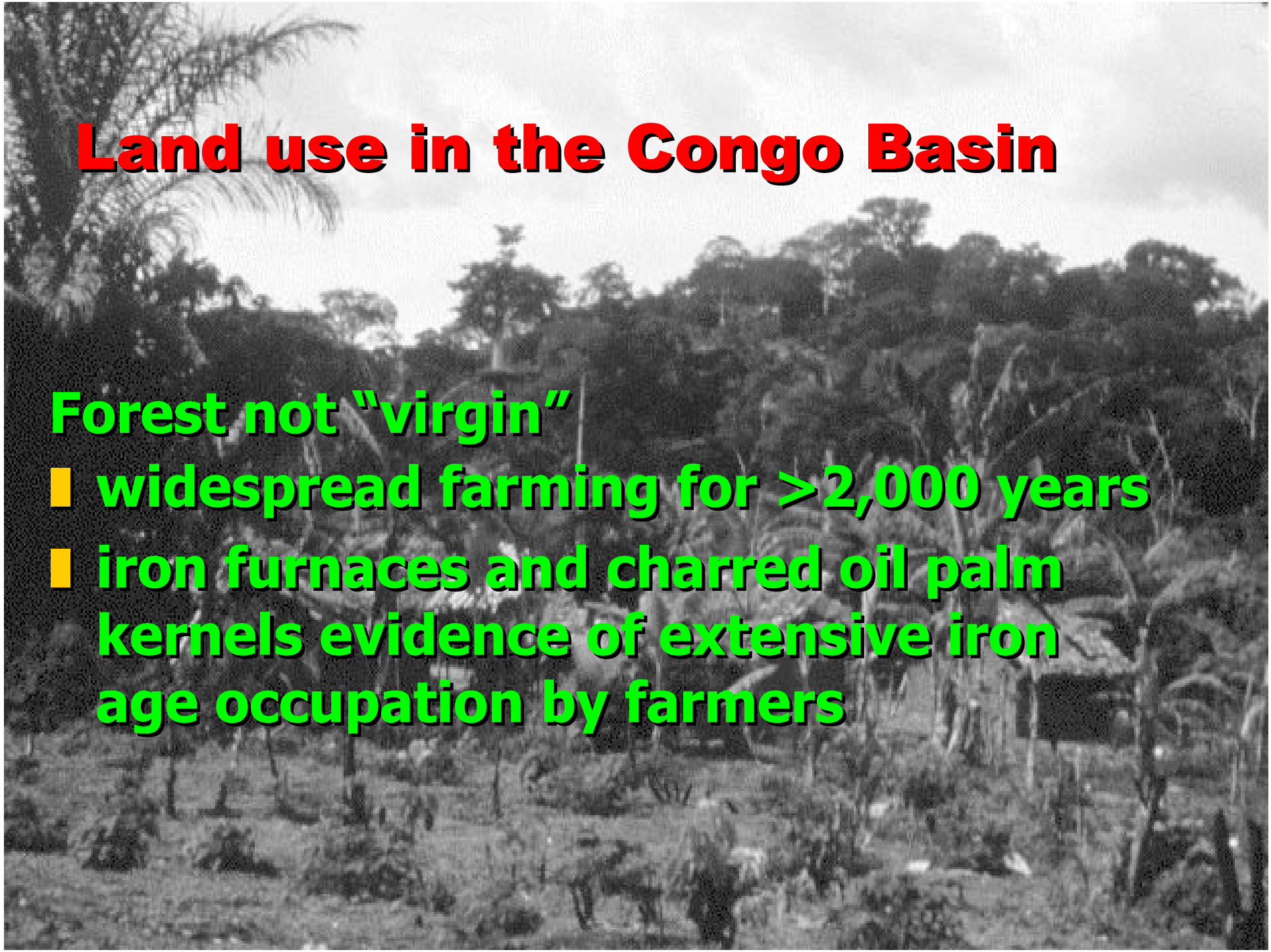
## Others



- Alternatives to slash and burn (ICRAF - Cameroon)
- Peri-urban forest change in Gabon (APFT, ULB, UMd)
- Land cover change in Cameroon using remote sensing and household survey data (UMd, CIFOR)
- Rule-based modelling of local scale forest clearing and fragmentation in CAR (NASA, WWF)




- Landsat Pathfinder (NASA, UMd)
- Macro-economic dynamics and deforestation in southern Cameroon (University of Louvain and CIFOR)

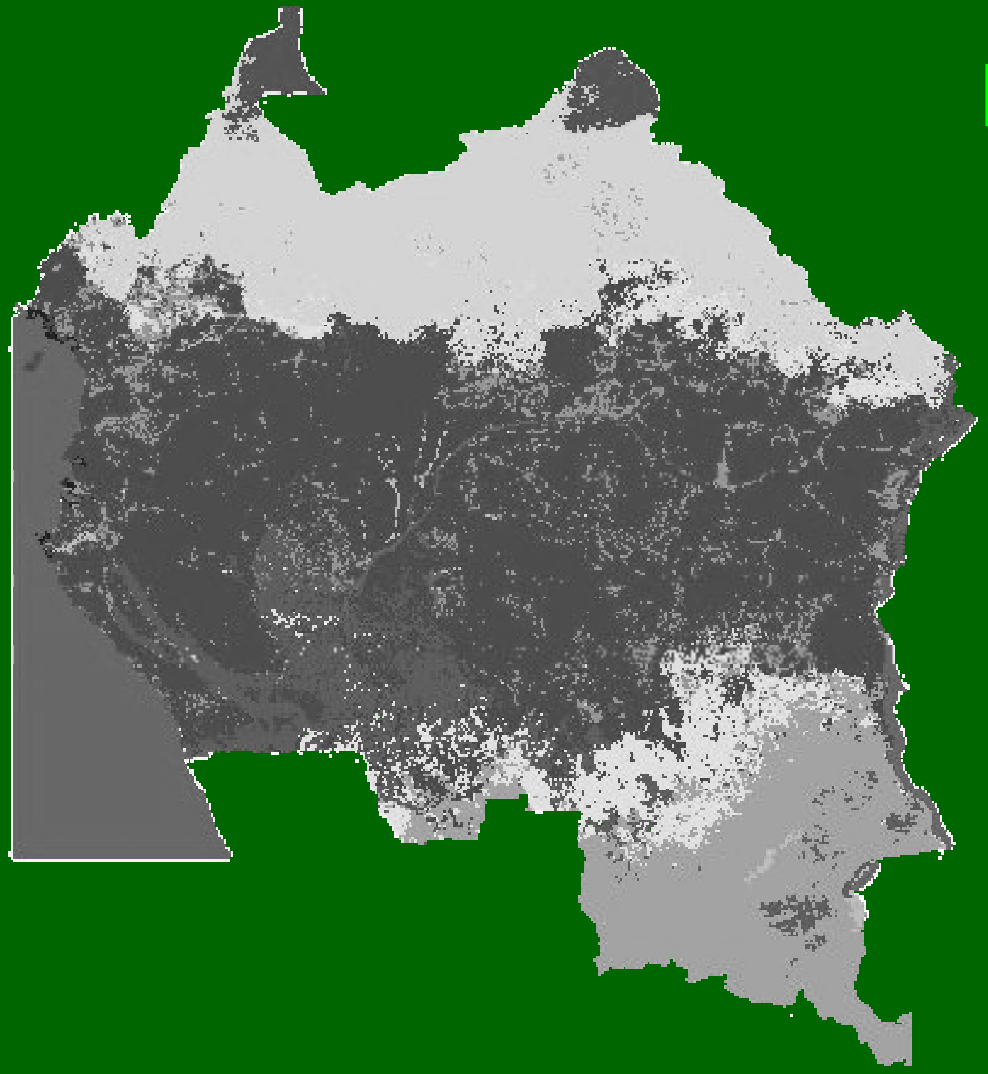

Land use in the Congo Basin
Forest not "virgin"
widespread farming for >2,000 years
iron furnaces and charred oil palm kernels evidence of extensive iron age occupation by farmers

# Land use in the Congo Basin

## Demographic Changes

- evidence of population crash in Gabon 400-700 years ago
- forest population reduced by 50% in first 20 years of this century
- demographic pressure varies across the basin
  - urban populations 40-60%
  - DRC and Cameroon 10-14 people/$km^2$
  - Gabon, Congo, Equatorial Guinea, CAR 2-3 people/$km^2$
  - growth rates 2.5%

# Land use in the Congo Basin



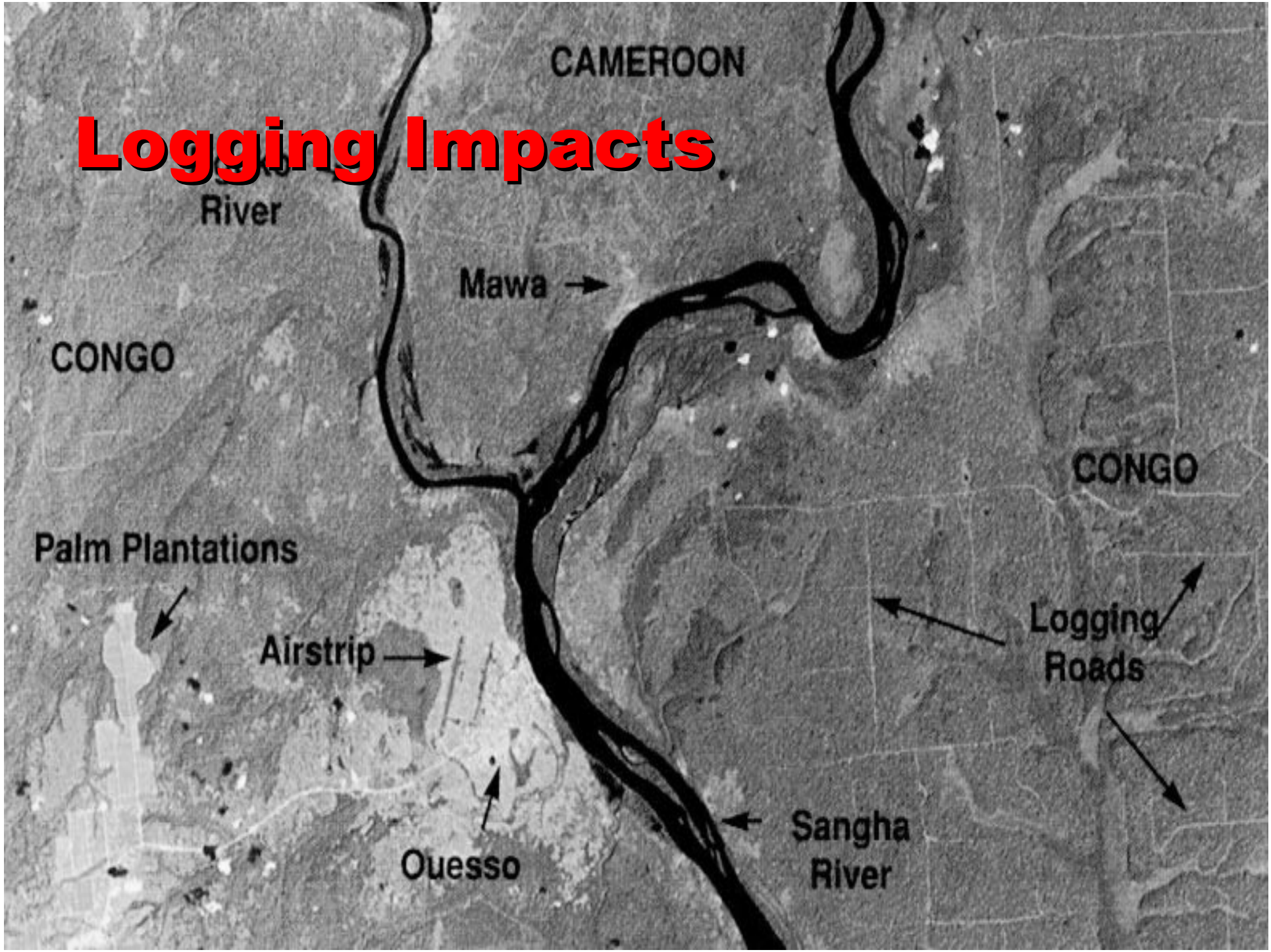
## Economic factors

- Prior to 1850s little extra-regional trade
- Early colonial period - river transportation
- 1920-1950 - road building
- Logging - extensive old-growth mining

# Land cover change

## Logging

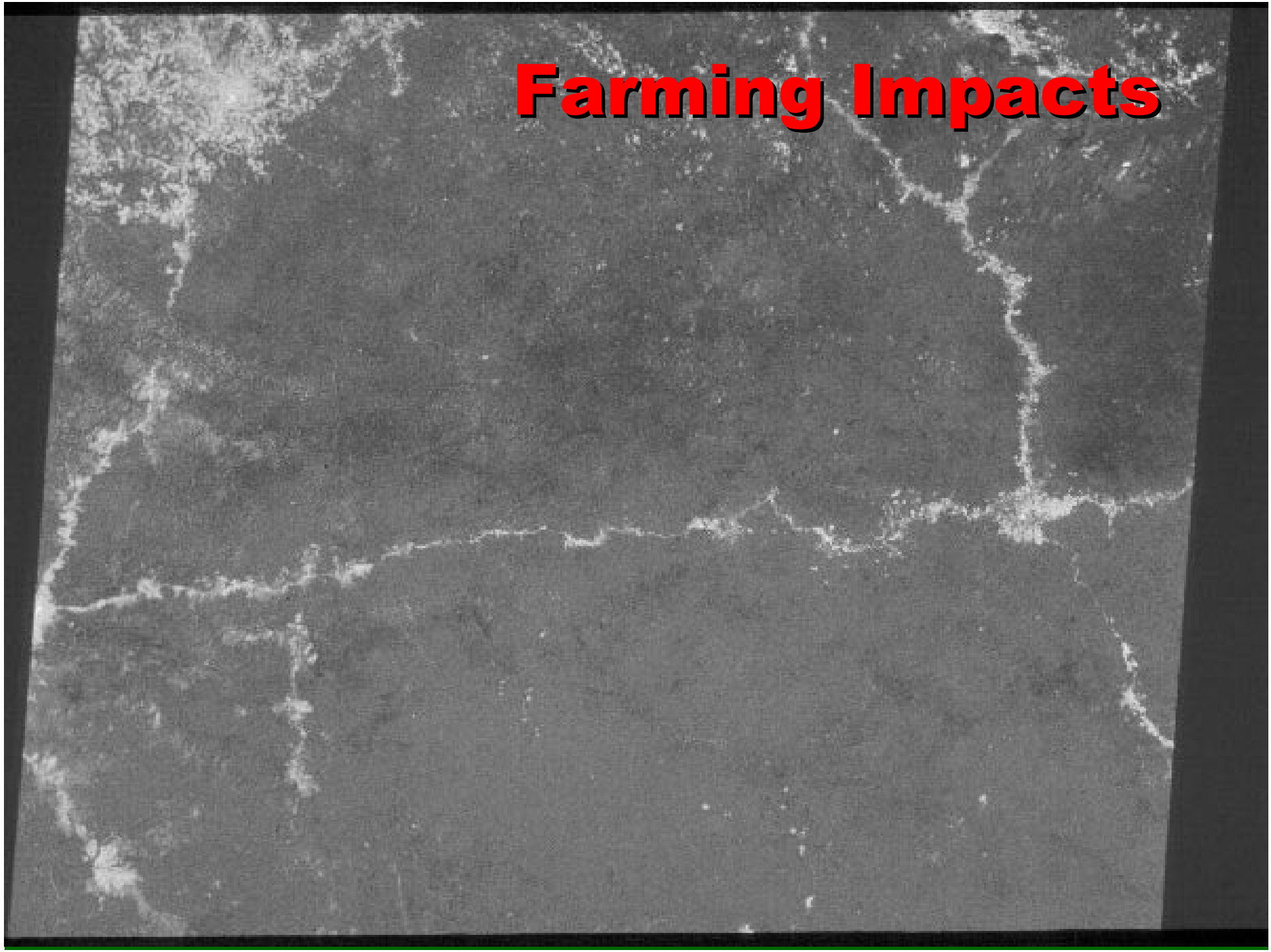
- markets for only a few species
- extensive not intensive harvesting
  - 1-2 trees per hectare
  - <10% of the canopy disturbed
- defaunation not deforestation
- habitat fragmentation not deforestation
  - extensive network of unpaved roads


Logging Impacts
CAMEROON
River
Mawa
CONGO
CONGO
Palm Plantations
Airstrip
Logging
Roads
Ouesso
Sangha
River

# Land cover change

## Agriculture

- little industrial scale farming
- extent of family farms based on demographic pressure, farm-gate prices, and market access


Farming Impacts

# LCLUC modelling in Dzanga-Sangha protected area, CAR

## Goals of the study

- Help WWF better understand the likely future extent and patterning of forest clearing for agriculture in the Dzanga-Sangha special reserve

# LCLUC modelling in Dzanga-Sangha protected area, CAR

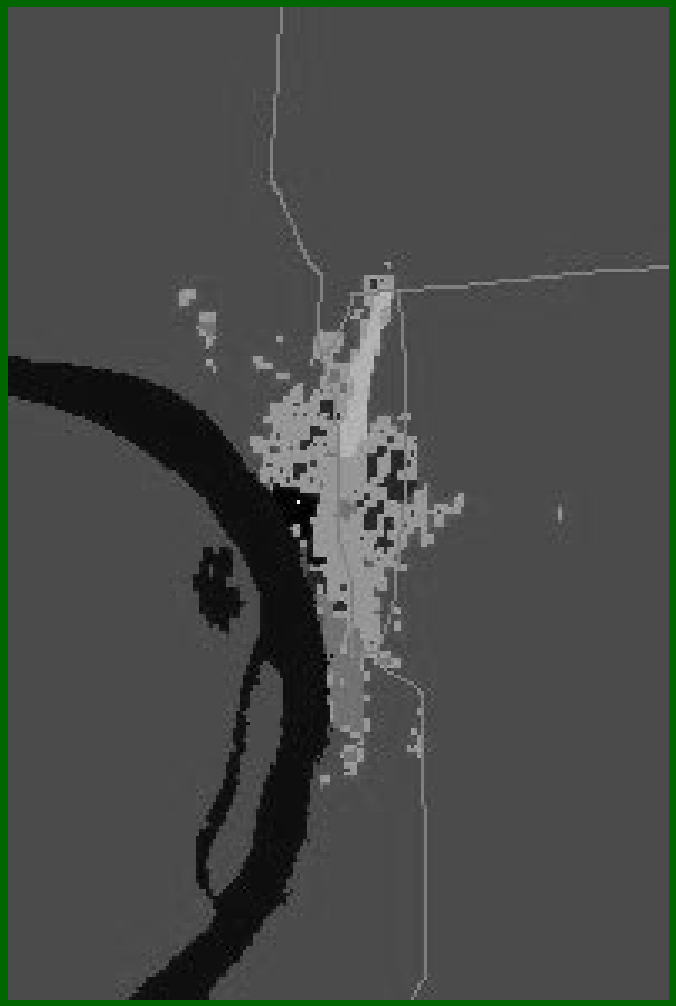
## Value of spatially explicit, rule-based models

- based on actual land use decisions and behaviors of forest families
- characterizes both scale of land cover transformation and extent of habitat fragmentation
- allows creation of "what if" scenarios essential to effective management of protected area resources

# LCLUC modelling in Dzanga-Sangha protected area, CAR

## Parameters and rules

- Initial land cover based on classified Landsat TM imagery
- family size, nutritional requirements, and crop productivity determine field area needs
- fallow period, crop productivity, labor costs and labor allocation determine area of each forest cover type that can be converted to agriculture
- travel costs and proximity to active cropland determine field location



# LCLUC modelling in Dzanga-Sangha protected area, CAR

## Simulation scenarios

- status quo
- increased market access
- revitalization of the logging concession